

## ABSTRACT OF THE DISCLOSURE

A plasma processing apparatus includes a vacuum vessel as evacuated by an evacuation system, a gas supply for supplying a processing gas into the vacuum vessel, an electrostatic chucking device for holding thereon a sample to be processed within the vacuum vessel, a lower electrode, a bias power source connected to the lower electrode for supplying bias power, and a radiator for radiating a high frequency electromagnetic wave within the vacuum vessel. The processing gas is made plasmatic and plasma is generated for use in performing processing of the sample to be processed. The radiator for radiating a high frequency electromagnetic wave including an antenna which is provided within the vacuum vessel. The antenna includes a conductor opposing the lower electrode and being connected to a high frequency bias power supply and a plate contacted with the conductor. The vacuum vessel includes a process chamber with a sidewall, and the side wall is under temperature control for forming on an inner wall surface thereof a coating film similar in composition to the processing gas used during etching treatment.

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